98/01550 Possible improvements to the back-pulse cleaning of ceramic candle filters
Christ, A. *et al.* *Proc. Int. Conf. Fluid. Bed Combust.*, 1995, 13, (1), 241–250.
If hot gas filters with ceramic filter elements are to be successfully operated in coal fired power generation processes, stable cleaning of the filter elements is essential. The most common cleaning strategy for candle filters is back-pulse cleaning. To optimize this an in-depth understanding of the physical phenomena involved in the build-up and break up of dust cakes is necessary. The strength of flat filter cakes was tested by measuring the pressure difference driving the reversed gas flow through the filter that causes cake failure, in order to determine the cohesive forces in a filter cake. Based on a model by H. Rumpf (1958) the measured strength of filter dust cakes was evaluated and discussed. Video observations of the pulse cleaning event and investigations on the particle aggregation immediately following the cleaning event are also analysed and recommendations for improved efficiency of the pulse cleaning are made. For the filtration process itself the permeability of dust cakes is of paramount importance. Most approaches to calculate the permeability on the basis of porosity and dust properties render poor agreement with experimental data when porosities >75% are used. An extension to the Free-Surface-Model of J. Happel (1958) is proposed that shows a strongly improved accuracy compared to the original model or the Carman–Kozeny correlation.

98/01551 Thermodynamic databases of ceramic materials
Seifert, H. J. and Aldinger, F. *Netsu Sokutei*, 1997, 24, (4), 188–193.
The development of consistent analytical descriptions of the functions of states for all phases of the treated system is necessary for assembling thermodynamic databases. To provide high-quality data sets the Gibbs energy functions are assessed by computer supported optimization of phase diagrams using all experimental data available in the literature and experiments. The CALPHAD method and the phase modelling is described with special emphasis on ceramic solution phases. The method is illustrated by the thermodynamic assessment of the B–C–N–Si–O system.

98/01552 Utilization of fly ash for ceramic industry
Sen, S. K. and Aggarwal, P. S. *Silic. Ind.*, 1997, 62, (1–2), 39–42.
Fly ash from an Indian thermal power station was characterized and used for development of wall tiles, acid and abrasion-resistant tiles and sewer pipes.

13 SPACE HEATING AND COOLING

98/01553 Active solar space heating of residential buildings in northern Hellas—a case study
Argiriou, A. *et al.* *Energy and Buildings*, 1997, 26, (2), 215–221.
Almost one-third of the total energy budget is represented by the final energy consumption in Hellenic residential and tertiary sector buildings. Space and water heating represents 70% of this total. Space heating and electricity generation in Hellas are based on fossil fuels, with a serious environmental impact. Despite the popularity of simple solar domestic hot water systems, active solar space heating remains marginal. This paper aims to demonstrate the potential of combined active space and domestic hot water solar systems, both technically and economically. The reduction in environmental impact is also assessed. Modern solar technology is found to be a viable option for energy retrofit in the Hellas building sector.

98/01554 Analysis of the Stirling heat engine at maximum power conditions
Erbay, L. B. and Yavuz, H. *Energy*, 1997, 22, (7), 645–650.
The Stirling heat engine operating in a closed regenerative thermodynamic cycle is analysed. Polytropic processes are used for the power and displacement pistons. Following regeneration, the maximum power density and efficiency are found and the compression ratio at maximum power density is determined.

98/01555 Cooling and heating loads in residential buildings in Jordan
Shariah, A. *et al.* *Energy and Buildings*, 1997, 26, (2), 137–143.
Three different cities in Jordan, Irbid, Amman and Aqaba, were chosen for study to represent three climatic regions. The cooling and heating load calculations for air-conditioned and heated buildings have been calculated for the cities. The insulation effect of buildings was analysed; for each region four combinations were considered: no insulation; only wall insulated; only ceiling insulated; and both ceiling and wall insulated. The results showed that the average monthly heating load was reduced when only walls were insulated, but this has a negative impact on the average monthly cooling load. In the case where only the ceiling was insulated, both the monthly cooling and heating loads were reduced. A comparison showed that with both wall and ceiling insulated, the energy requirements could be reduced by more than 40%. In Aqaba, with both walls and ceiling insulated, there would be no need for any heating during the whole year and in both Amman and Irbid there were at least four months in which there would be no need for either heating or cooling.

98/01556 Cooling and power efficiency diagrams for compressor-driven, metal-hydride slurry air conditioners
Kim, K. J. *et al.* *Energy*, 1997, 22, (8), 787–796.
In order to study a compressor-driven, metal-hydride slurry air conditioner, finite-time thermodynamics were used. The system has the potential to achieve high cooling power and efficiency. Important parameters such as the total heat conductance between reactors and reservoirs, pressure ratio of the compressor, mass ratio of slurry to hydrogen, compressor efficiency, heat of desorption, and fraction of heat conductance associated with the cold reservoir were considered.

98/01557 Effect of packing density on performance of charcoal-nitrogen adsorption cryocoolers
Rao, R. R. *et al.* *Carbon*, 1997, 35, (10–11), 1559–1566.
The development and validation of a computational scheme for an analysis of activated charcoal nitrogen adsorption cryocoolers is discussed. A comparative analysis of four samples of charcoal was carried out, using this procedure. The specific power of the cryocooler was found to be governed by the packing density achievable in addition to the charcoal adsorption characteristics, cycle operating pressures and temperatures. A 77 K cryocooler with an specific power of the order of 400 W W^{-1} can be achieved with a charcoal packing density of about 1 g cm^{-3} for several available charcoals. The analysis shows that Fluka and BCGI specimens can yield promising results under the present technologically realizable conditions.

98/01558 Effect of thermal storage on the performance of an air collector: a periodic analysis
Goyal, R. K. *et al.* *Energy Convers. Mgmt*, 1998, 39, (3/4), 193–202.
Parametric studies are presented for an air collector consisting of different thermal energy storage materials on top, but with soil at the bottom. The effect of storage material, optimization of length and thickness of storage material, and the effect of flow rate on outlet air temperature, useful energy gain and daily efficiency is reported. For a typical June day in Delhi, numerical computations have been calculated. Owing to the storage effect, a significant phase shift occurred. The hourly maximum useful energy gain decreases with the fraction of storage material thickness, whereas the minimum amount increases and approaches the maximum value.

98/01559 Effect of twisted strips on heat transfer and pressure drop in heat exchangers
Yildiz, C. *et al.* *Energy Convers. Mgmt*, 1998, 39, (3/4), 319–330.
In the inner pipe of a concentric double-pipe heat exchanger, twisted narrow, thin metallic strips were placed and their effects on heat transfer and pressure drop were studied for parallel and counter-current flow. These turbulators were prepared by twisting the strips through certain angles and designed to touch the inside wall at each step. Hot air was passed through the inner pipe and cold water flowed simultaneously through the annulus. Experiments performed with an empty inner tube confirmed the results with the Dittus–Boelter expression given for the Nusselt number. The Nu number could increase up to 100% at a cost of about 130% increase in pressure drop for the tube with twisted strips inside.

98/01560 Effective use of mobile air-conditioners in deep mines
Yakovenko, A. K. and Martynov, A. A. *Ugol' Ukr.*, 1996, (10–11), 16–20. (In Russian)
The use of mobile air conditioners for cooling workplace air in deep (1000–1300 m) coal mines in the Ukraine is discussed.

98/01561 Efficiency of an Atkinson engine at maximum power density
Chen, L. *et al.* *Energy Convers. Mgmt*, 1998, 39, (3/4), 337–341.
Most performance analyses in finite-time thermodynamics studies concern the maximum power output and the corresponding efficiency for heat engines. Instead of just maximizing power for a cycle, the power density is maximized for an Atkinson engine in this work. The efficiency at maximum power density is always greater than that at maximum power and the design parameters at maximum power density lead to smaller and more efficient Atkinson engines with larger pressure ratios.

98/01562 Exergy analysis of a liquid-desiccant-based, hybrid air-conditioning system
Ahmed, C. S. K. *et al.* *Energy*, 1998, 23, (1), 51–59.
The applicable exergy analysis and estimate irreversible losses that are generated during operation of a hybrid air-conditioning cycle with emphasis on a partly closed solar regenerator that is used to regenerate weak desiccant. The desiccant mass-flow rate has been chosen as the fundamental parameter for analysing the system. We find an optimum mass-flow rate for minimum irreversibility, i.e. maximum exergy. Large irreversibilities occur for high ambient vapour pressures, which tend to decrease the system exergy and overall performance of the regenerator.